

DESCRIPTION OF NEW FORMS OF UPPER CAMBRIAN FOSSILS.

BY
CHARLES D. WALCOTT,
Honorary Curator Department of Paleozoic Invertebrate Fossils.

(With Plates xx, xxi.)

In the course of a review of the Cambrian faunas it becomes necessary to designate a number of undescribed species by name in the lists from the various localities. They are from New York, Wisconsin, Minnesota, Texas, Nevada, and Dakota, and may all be referred to the Upper Cambrian fauna. In New York and Texas two subfaunas exist, in Wisconsin three, and in Nevada two, and possibly three.

Metoptoma ? *minneiskensis* sp. nov.

Plate xx, Fig. 2.

Shell conical, broadly elliptical in outline, apex pointed, subcentral, surface marked by broad undulations of growth in some specimens, while in others it is nearly smooth. Peristome broadly sinuate in front and back, in the narrow specimens, and usually so on the anterior side in all. Outer surface of shell unknown.

This species is one of the numerous conical, paterelloid shells that are referred to the genus *Metoptoma* while awaiting more definite information as to their true generic relations. Mr. W. A. Finkelnburg sent a number of specimens and Dr. Cooper Curtice collected a few.

Formation and locality.—Upper Cambrian Sandstone (Middle horizon) Minneiska, Minnesota.

Nat. Mus. Cat., Invert. Foss., 23844.

Metoptoma ? *peracuta* sp. nov.

Plate xx, Fig. 1.

Shell very elongate, conical, rounded, elliptical to circular in outline at the aperture. Surface marked by more or less distinct undulations of growth. Apex subcentral. Outer surface unknown.

This species occurs at the same horizon as *M.* ? *minneiskensis* in a friable sandstone. It differs in being much more elongate and the less excentric position of the apex.

Formation and locality.—Upper Cambrian Sandstone (Middle horizon) at Spofford's Bluff, Wisconsin. Collector, Dr. Cooper Curtice.

Nat. Mus. Cat., Invert. Foss., 23843.

Platyceras hoyti sp. nov.

Plate xx, Fig. 8.

Shell small, depressed, making about three volutions, the interior below the plane of the outer volution. Volutions contiguous throughout their extent, expanding gradually to the somewhat compressed, more rapidly expanding outer whorl. Aperture unknown.

Outer surface of shell marked by fine concentric striae and the inner surface by longitudinal striae.

This species differs from the associated *P. minutissimum* in the form of the whorls and surface characters. The longest specimen has a transverse diameter of 4^{mm}.

Formation and locality.—Upper Cambrian limestone, 4 miles west of Saratoga Springs, New York. C. D. W., collector.

Nat. Mus. Cat., Invert. Foss., 23846.

Platyceras texanum sp. nov.

Plate xx, Fig. 5.

Capulus sp.? Shumard, 1861, Am. Jour. Sci., 2d ser., vol. 32, p. 221.

Shell small, making about two (?) volutions, the interior below the plane of the outer volution but not quite on the median line. Volutions apparently contiguous throughout their extent, the inner, or spire, small, gradually expanding; body volution strongly carinate upon the dorsum, and expanding gradually to the large subelliptical outer portion. Aperture unknown.

This species is more nearly related to *P. minutissimum* of the Potsdam of New York than to *P. hoyti*. The longer specimens have a diameter of 7^{mm} across the body whorl.

Formation and locality.—Upper Cambrian Limestone, of Packsaddle Mountain, Burnet County, Texas. Collector, C. D. W.

Nat. Mus. Cat., Invert. Foss., 23845.

Genus **TROCHUS** Linn.

Trochus? *saratogensis* sp. nov.

Plate xx, Fig. 3.

Shell trochiforme, sinistral, broadly conical with about four slightly convex whorls; base concave; umbilical surface sloping inward from the angle produced by its union with the outer curvature of the body whorl; umbilicus rounded and of medium size; aperture obliquely subelliptical; periphery unknown. Surface marked by a few fine striae of growth.

The shell occurs in association with *Dikellocephalus hartti*, *D. speciosus*, *Lingulepis acuminata*, etc., of the Upper Cambrian fauna. It is not a true Trochus, and in the photograph plate illustrating the Potsdam fauna of Saratoga County, New York, that I had prepared in 1885, it bears the name *Billingsia saratogensis*. This generic name was used in a list of species in 1886,* but no publication of the description of the species has yet appeared. The name *Billingsia* having been used the species is provisionally referred to *Trochus* until further comparisons can be made with *Eotrochus* and other genera of the Trochidae.

Formation and locality.—Limestone of the Potsdam terrane, 4 miles west of Saratoga Springs, New York. Collector, C. D. W.

Nat. Mus. Cat., Invert. Foss., 23847.

Hyalithes attenuatus sp. nov.

Plate XX, Figs. 11, 11a.

Form an extremely elongate triangular pyramid. Transverse section subtriangular, width and depth as three to two. The dorsal side nearly flat, with the exception of a shallow, narrow, median groove. Ventral face convex, with the ventral angle broadly rounded. Surface apparently smooth.

In its rounded ventral side this species resembles *H. princeps* of the Lower Cambrian.

Formation and locality.—Upper Cambrian limestone of the Highland Range section, central Nevada. Collector, C. D. W.

Nat. Mus. Cat. Invert. Foss., 23850.

Hyalithes curvatus sp. nov.

Plate XX, Figs. 7, 7a.

Shell, an elongate curved pyramid that becomes attenuated towards the apex. Transverse section triangular, with the width and height subequal. Ventral face very convex, strongly angular at the center, sides slightly rounding. Dorsal face slightly convex or nearly flat at the margin and rising towards the center. Dorso-ventral angles sharply and clearly defined. Anterior extension of the dorsal surface and form of aperture unknown. Shell apparently thick. Surface of the shell marked by strong concentric lines of growth near the aperture, and longitudinal lines that separate fine, rounded ridges, not much wider than the depressions between them. These are not shown in the figure.

The tendency to curvature is shown in several species illustrated by M. Barrande, but none is so marked as in the species under consideration.

* Bull. U. S. Geol. Surv., No. 30, 1886, p. 21.

Formation and locality.—Associated with the preceding species. Collector, C. D. W.

Nat. Mus. Cat. Invert. Foss., 23851.

Hyalolithes ? *corrugatus* sp. nov.

Plate xx, Fig. 9.

Shell, an elongate, gradually and regularly tapering, obscurely subtriangular cone. Transverse section oval and somewhat flattened on one side, so as to give it a subtriangular form in some specimens. It is difficult to determine the dorsal and ventral faces in the absence of the aperture. Shell, strong; surface marked by prominent corrugations or undulations that are a little oblique to the longitudinal axis; they occur on the flattened sides and are not continuous across the narrow portion. There is also considerable variation in their depth and width, the interior casts usually showing the strongest undulations.

This shell does not appear to be a true *Hyalolithes*. In many respects it is more closely related to *Coleoprion* or *Coleolus*, but varies in essential particulars. While awaiting further study a provisional reference is made to *Hyalolithes*.

Formation and locality.—Associated with the two preceding species. Nat. Mus. Cat. Invert. Foss., 23852.

Hyalolithes newtoni sp. nov.

Plate xx, Fig. 4.

Form, an elongate, triangular pyramid. Transverse section subtriangular, slightly concave on the dorsal, and very convex on the ventral side. Dorsal face rounded on the margin and concave all across; anterior extension unknown. Ventral face highly convex and rounded along the median line. Aperture and operculum unknown. Shell apparently thick, but this is probably owing to the mode of preservation, as in a few specimens it is thin. Surface of shell as far as known marked only by a few concentric striae.

The concave dorsal service taken in connection with the general outline serves to distinguish this species from others known to me.

Formation and locality.—Upper Cambrian, near Deadwood, Black Hills, Dakota. Collected under charge of Prof. F. R. Carpenter.

Nat. Mus. Cat. Invert. Foss., 23849.

Conularia cambria sp. nov.

Plate xx, Fig. 10.

Form, an elongate pyramid, with a quadrangular ? base. Transverse section and aperture unknown, owing to the flattening of all the specimens. Angles of the pyramid marked by a very distinct groove. Faces of the pyramid slightly convex in the flattened specimens.

Surface marked by seven to nine longitudinal elevated lines on each face. If transverse striæ existed they have not been preserved on the cast or the matrix of any specimens in the collection.

The conditions of preservation are such that the original form can not be definitely determined, and the angle subtended by the sides of the pyramid is unknown. The apparently equal sides indicate a quadrangular section and a long, narrow pyramid. The specimen illustrated is the matrix of a crushed shell, showing the depressed line at the angle and the longitudinal lines of the faces. The longest specimen has a total length of 6^{cm} and a width of 16^{mm} on one face at the apertural end.

Formation and locality.—Middle beds of the Upper Cambrian (Potsdam) sandstone, Pilot Knob, Wisconsin. Collector, Dr. Cooper Curtice. Nat. Mus. Cat. Invert. Foss., 23848.

Spirodentalium gen. nov.

Shell tubular, curved, opened at both ends; attenuated posteriorly; aperture circular.

Surface spirally striated.

Type: *Spirodentalium osceola*.

This genus is founded to include a species that, with the exception of spiral striæ, might be referred to the recent genus *Dentalium*. The presence of spiral striæ, and the fact that it occurs so low down in the Paleozoic, are the principal reasons for distinguishing it from *Dentalium*.

Spirodentalium osceola sp. nov.

Plate xx, Fig. 12.

Shell elongate tubular, curved, longitudinally marked by several narrow grooves (two only are shown in the cast), open at both (?) ends, and gradually tapering towards the posterior end. Aperture, as far as known, circular and not constricted. Surface ornamented by spiral striæ that, from the portion of the surface preserved, passed around the tube three or four times in a length of 6 centimeters, the tube having a diameter of 7 millimeters at the aperture and 2.5 millimeters at the posterior end.

The specimen of this species now known occurs in a friable, brown sandstone as cast and the matrix. The drawing was made from a plaster cast taken in the matrix. The circular form of the tube is shown by the interior cast. Whether the posterior end terminates in an opening is not proven positively, but in the only specimen known it ends abruptly where the tube has a diameter of 2.5 millimeters. There is a slight trace of what may have been the tube, 1 centimeter further on, but this is uncertain.

The specific name is given from that of the old Indian chief Osceola. *Formation and locality*.—Upper portion of Cambrian (Potsdam terrane), Osceola Mills, Wisconsin. Collected by Dr. Cooper Curtice. Nat. Mus. Cat. Invert. Foss., 23853.

Ptychoparia burnetensis sp. nov.

Plate XXI, Fig. 1.

Head within the facial sutures subquadrangular, exclusive of the somewhat prolonged postero-lateral limbs.

Glabella convex, truncato-conical; exclusive of the occipital segment it is less than one-half the length of the head; glabellar furrows, if present, have been lost by the destruction of the outer surface of the test; occipital furrow strongly marked and extended as a deep groove across the postero-lateral limbs; occipital segment narrow and arching a little backward. Fixed cheeks narrow; palpebral lobes small; frontal lobe about one-sixth the length of the head and separated from the strong, somewhat elevated, frontal rim by a broad, rounded groove. The associated free cheek terminates in a short postero-lateral spine.

Formation and locality.—Upper Cambrian (Potsdam) Sandstone. "Tatur Hill," Burnet County, Texas. Collector, C. D. W.

Nat. Mus. Cat. Invert. Foss., 23854.

Ptychoparia connata sp. nov.

Plate xx, Fig. 2.

Of this species only the central portions of the head are now known. The glabella is truncato-conical, moderately convex, and marked by three pairs of slightly indented glabellar furrows. Occipital furrow narrow and arching forward at the center; occipital segment of medium width and slight convexity. Free cheeks, narrow; palpebral lobes about one third of the length of the head. Frontal limb narrow, and separated from the strong, rounded frontal rim by a broad shallow groove.

What we have of this species may be compared with *Ptychoparia oweni*, M. & H., *P. wisconsinensis*, and *P. (C.) iowensis*, Hall. It differs in the strong frontal rim and groove in front of the glabella.

Formation and locality.—Upper Cambrian (Potsdam) sandstone, Eau Claire, Wis. Collector, Dr. Cooper Curtice.

Nat. Mus. Cat. Invert. Foss., 23855.

Ptychoparia llanoensis sp. nov.

Plate XXI, Figs. 3, 4, and 5.

Of this species there has been found the head, including the free cheeks, and the pygidium.

Glabella truncato-conical, the front broadly rounded; marked by three pairs of furrows that indent the surface from just within the mar-

gin obliquely backward about one-fourth the distance across. Occipital furrow, narrow and arching forward at the center; occipital segment of medium width, arching forward at the center where a small, sharp node occurs; dorsal furrows strongly defined all about the glabella.

Fixed cheeks narrow and merging posteriorly into the rather long postero-lateral limb, and anteriorly into the broad slightly convex frontal rim; palpebral lobes of medium size. The only division between the frontal limb and the nearly flat margin is a series of slight indentations; a similar line is also seen on the under side; in some specimens, however, this line of indentations is not shown and the frontal limb and rim merge together; in some others a slight transverse groove indicates the line of separation. The free cheeks are prolonged posteriorly into a long slender spine and have a faintly defined marginal rim.

The associated pygidium is transverse, convex, and strongly trilobed by the prominent, convex median lobe; marginal border narrow and nearly flat; median lobe divided by three transverse grooves into three annulations and a posterior more elongate termination; lateral lobes somewhat depressed and marked by three shallow furrows that extend from the median axis to the flattened margin.

Test rather thick over the frontal lobe and margin and strong on other parts. Surface apparently smooth or finely striate; this character is not well shown.

Of described species this is most nearly allied to *Ptychoparia eryon* Hall.*

Formation and locality.—Upper Cambrian limestone. Packsaddle Mountain, Llano County, Texas. Collector, C. D. W., 1884.

Nat. Mus. Cat. Invert. Foss., 23857.

Ptychoparia ? metra sp. nov.

Plate XXI, Figure 7.

Glabella conical strongly convex; occipital furrow, broad, shallow, and rounded; occipital segment of medium width and convexity; dorsal furrows deep on the sides and strongly defined in front of the glabella. Fixed cheeks only a line between the dorsal furrow and palpebral lobes; the latter are relatively large and grooved by a broad furrow parallel to the margin; anteriorly the fixed cheek widens out to form a small subtriangular area before reaching the frontal furrow; its posterior extension is unknown; frontal limb very short and descending down to the broad, concave frontal furrow that curves up to meet the short edge of the strong thick frontal margin. Surface a little rough in the east; this may indicate a pustulose surface on the outer test.

This species is apparently congeneric with *P. urania* and the generic reference is provisional.

* Sixteenth Ann. Rep. State Cab. Nat. Hist., 1863, p. 157, pl. vii, figs. 10-16; pl. viii, figs. 16, 31.

Formation and locality.—Upper Cambrian (Potsdam Terrane). “Tatur Hill,” Burnet County, Texas. Collector, C. D. W., 1884.
Nat. Mus. Cat. Invert. Foss., 23858.

Ptychoparia pero sp. nov.

Plate XXI, Fig. 6.

The portion we have of this species is closely related to *P. explanata** Whitfield and *P. diademata*,† but differs in the conformation of the frontal limb, groove, and flattened margin. The specimens from Texas and Wisconsin appear to be identical as far as comparisons can be made between them.

Formation and locality.—Upper Cambrian (Potsdam Terrane). In a limestone on Morgan’s Creek, Burnet County, Texas, and in a buff or brown sandstone, Trempeleau, Wisconsin. Collectors, in Texas, C. D. W.; in Wisconsin, Dr. Cooper Curtice.

Nat. Mus. Cat. Invert. Foss., 23859.

Ptychoparia suada sp. nov.

Plate XXI, Fig. 9.

Glabella short, convex, truncato-conical; occipital furrow strongly defined; occipital ring convex, of medium width at the center and narrow at the sides; surface smooth; dorsal furrows deep on the sides and well marked in front of the glabella. Fixed cheeks narrow, convex, palpebral lobes relatively large and differentiated from the cheek by a shallow furrow; ocular ridge narrow; frontal limb rather long, abruptly curved downward to the narrow frontal rim.

The form of the head and glabella recalls *P. minor* of the lower portion of the Upper Cambrian sandstones of Wisconsin, but the absence of a nuchal spine and glabella furrows serves to distinguish them.

Formation and locality.—Upper Cambrian (Potsdam Terrane). In limestones on Morgan’s Creek, Burnet County, Texas. Collector, C. D. W.

Nat. Mus. Cat. Invert. Foss., 23860.

Ptychoparia ? urania sp. nov.

Plate XXI, Figs. 10 and 11.

Glabella tumid, truncato-conical in outline; surface marked by two pairs of furrows; the posterior pair extend obliquely backward so as to mark off a triangular lobe on each side. Anterior pair shorter and more transverse in their direction; occipital furrow rounded; occipital ring narrow; dorsal furrow strongly defined. Fixed cheeks narrow, posterior extension unknown; anteriorly they merge into the very short

* Geol. Wis., vol. IV, 1882, p. 181, pl. 1, figs. 27, 28.

† Sixteenth Rep. N. Y., State Cab. Nat. Hist., 1863, p. 167, pl. vii, figs. 36–39; pl. viii, figs. 18, 21.

frontal limb; palpebral lobes of medium size and separated from the cheek by a strong furrow; a short oblique ocular ridge crosses the dorsal furrow; frontal limb shown only at the sides, as the glabella arches down to the groove marking off the broad companulate frontal rim; the latter extends forward to a blunt point and is nearly one-third the entire length of the head. The associated free cheek has a broad margin and a relatively small trapezoidal-shaped body beneath the base of the eye lobe.

Surface of the glabella, fixed cheeks, and body of free cheeks strongly pustulose; frontal and side margin smooth.

That this species is not a true *Ptychoparia* is evident; it is so referred with *P. ? pernasutus* and other species, while awaiting a revision of the genera of American Cambrian trilobites.

Formation and locality.—Upper Cambrian (Potsdam Terrane). Packsaddle Mountain, Llano County, Texas. Collector, C. D. W.

Nat. Mus. Cat. Invert. Foss., 23861.

Ptychoparia vacuna sp. nov.

Plate XXI, Figs. 8 and 12.

The portions of the head preserved shows it to have been strongly convex. Glabella slightly converging towards the broadly rounded front; glabellar furrows slightly impressed, three in number on each side, and extending obliquely inward nearly one-third the distance across. Occipital furrow shallow, and arching forward at the center; occipital segment narrow, arching forward and with a small node at the center.

Fixed cheeks practically obsolete, except in their extension into the long, postero-lateral limbs; palpebral lobes unknown; frontal limb very broad, sloping abruptly downward from the faint dorsal furrow in front of the glabella to where it curves forward and merges into the flattened frontal borders. Surface apparently smooth.

Formation and locality.—Upper Cambrian (Potsdam Terrane) Limestone in Spring Creek Cañon, Black Hills, Dakota. Collected under charge of Prof. F. B. Carpenter.

Nat. Mus. Cat. Invert. Foss., 23862.

Ptychoparia (Liostracus) panope sp. nov.

Plate XXI, Fig. 13.

Of the species we have only the portions within the facial sutures.

Glabella convex, sides converging a very little towards the broadly rounded front; glabellar furrows scarcely to be distinguished on the smooth surface; occipital furrow well defined and arched forward at the center; occipital segment a little broader at the center than at the sides, slightly convex and arched forward near the center; dorsal groove distinct all about the glabella.

Fixed cheeks of medium width; palpebral lobes rather long, narrow, and separated from the cheeks by a narrow and distinctly marked groove; a narrow ocular ridge crosses the cheek from the palpebral lobe to the dorsal furrow.

Frontal limb of medium length and bent downward from the dorsal suture to where it curves outward and merges into the flattened border. Surface smooth.

Formation and locality.—Upper Cambrian (Potsdam Terrane) Limestone in Spring Creek Cañon, Black Hills, Dakota. Collected under charge of Prof. F. B. Carpenter.

Nat. Mus. Cat. Invert. Foss., 23856.

Agraulos saratogensis sp. nov.

Plate XXI, Fig. 14.

Bathyrus armatus Walcott, 1879, 32d Rep. State Mus. Nat. Hist. New York, p. 131.

Ptychoparia (A.) *saratogensis* Walcott, 1886, Bull. U. S. Geol. Survey, No. 30, p. 21.

(Name used only in list.)

Head convex, slightly semi-subelliptical in outline, and terminating in round, short, postero-lateral spines.

Glabella moderately convex, truncate conical, sides converging slightly towards the broadly rounded front, about one-sixth longer than wide; marked by two pairs of slightly indented glabellar furrows that extend inward with a slight backward obliquity; on the casts of the interior of the larger specimens the furrows are scarcely to be seen; occipital furrow well defined and arched forward at the center; occipital segment rising to a short, blunt spine at the center and narrowing towards the sides; dorsal furrow well defined about the glabella.

Fixed cheeks narrow, anteriorly they merge into the broad rounded frontal limb, and posteriorly into the short postero lateral limbs; palpebral lobes small and situated a little in front of the transverse center of the head. The frontal limb about one-fourth the length of the head and curved down to the margin without any intervening furrow.

Free cheeks convex and somewhat tumid, irregularly triangular in outline and without a marginal border. The associated pygidium is convex, strongly lobed and without a distinct marginal furrow. Axial lobe intermarginal, convex, and divided into four annulations and an anterior doublure by four distinct transverse furrows; lateral lobes crossed by three main furrows and two shorter ones, corresponding to the furrow on the lateral lobe of the thoracic segments, thus outlining three anchylosed segments in the pygidium; a fourth segment and the terminal portion are also outlined by a very faint ridge.

Thorax unknown.

This is a very distinctly marked species allied to *Bathyrus armatus* Billings.*

* Pal. Foss., vol. 1, 1865, p. 411.

Formation and locality.—Limestone of the Potsdam Terrane, 4 miles west of Saratoga Springs, N. Y. Collector, C. D. W.

Nat. Mus. Cat. Invert. Foss., 23863.

Agraulos ? thea sp. nov.

Plate XXI, Fig. 15.

Glabella convex; sides subparallel; front broadly rounded; surface marked by three pairs of slightly impressed furrows; occipital segment narrow, transverse, clearly defined by the narrow transverse occipital furrow; dorsal furrow deep all about the glabella.

Free cheeks subtumid and merging anteriorly into the narrow, rounded frontal limb; palpebral lobe of medium size and situated a little back of a transverse line crossing the center of the head; postero-lateral limbs short and strongly grooved by the marginal furrow; frontal limb very short and rounded into the margin.

The associated pygidium is subtriangular in outline, convex; median lobe narrow, convex, elevated above the general surface of the pygidium; divided by transverse furrows into eight or nine anchylosed segments; both the furrows and the segments are carried out onto the convex lateral lobes.

This species occurs with *Ptychoparia minor* in the lower horizon of the Wisconsin Upper Cambrian section. The characters of the head and pygidium are such that the species is referred provisionally to *Agraulos*.

Formation and locality.—Upper Cambrian (Potsdam Terrane). Osceola Mills, Wis. Collector, Dr. Cooper Curtice.

Nat. Mus. Cat. Invert. Foss., 23864.

Illænurus ? dia sp. nov.

Plate XX, Fig. 6.

Glabella subquadrangular, convex, a little longer than wide and curving downward in front to the slightly arched margin; occipital furrow shallow, arched a little forward midway; occipital segment flat and practically a backward continuation of the glabella; dorsal furrows clearly impressed. Fixed cheek narrow; palpebral lobe rather long, separated by a narrow furrow from the cheek; posteriorly the cheek passes into the postero-lateral limb, the most of which is broken away; anteriorly it merges into a rather broad subtriangular expansion that extends from the palpebral lobe to the frontal margin. Surface apparently smooth.

This little head is distinct from any known to us. It appears to be a link between *Illænurus* and *Bathyurus*, or rather some of the species placed in the latter genus.

Formation and locality.—Upper Cambrian (Potsdam Terrane) Morgan's Creek, Burnet County, Texas. Collector, C. D. W.

Nat. Mus. Cat. Invert. Foss., 23865.

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